

rence was trivial. After a time, however, a crash a hundred feet below us and perhaps 590 feet away, and the immediate terror of the horse drew us to the door. As we emerged, every artificial projection on the summit was giving forth a brush discharge of electricity. The corners of the eaves of the observatory (made of Malthoid roofing), the arrow of the wind-vane, the cups of the anemometer—each sent forth its jet, while the high intake pipe of the precipitation tank on the apex of the summit was outlined with dull electric fire. Whenever our hands rose in the air every finger sent forth a vigorous flame, while an apple, partially eaten, in the hand of Captain Brambila sent forth two jets where the bite left crescent points. This latter phenomenon occurred, however, only when the apple was raised and ceased when it was lowered, so that the eating of the apple involved no visible eating of flame. To clap the climax, my felt hat above the brim flashed suddenly into flame. I could feel the draft, and it seemed to me I could hear it, too. The halo was dazzling, but before the senses could act it was gone. I had earlier rubbed Captain Brambila's hair, trying (but ineffectually) to elicit a discharge of electricity; because he was not so tall as I, nature selected me to serve as the point of electric discharge. So vivid were the flames that continued steadily to play from the corner of the observatory that I reached up to assure myself that the building was not actually on fire.

We felt no ill physical effects nor any special alarm, but for the sake of prudence we sought the interior of the observatory, where the pranks of the electricity were apparently completely avoided. About 7:30 p. m., an hour after the electric storm had burst, it had vanished. The clouds, however, continued to hover around the summit, and the following evening a heavy rainstorm swept from the mountain earthward toward Reno, gaining violence as it descended, until the valley was drenched. We followed the storm closely with but little inconvenience from rain.

Only once before have I met electricity actively present on Mount Rose. This was during the day of July 25, 1906, in a wet snowstorm accompanied by dense fog. At that time the thunder was pealing in the abyss below me, until I felt like some Jupiter hurling thunderbolts upon the earth beneath. Evidently the potential is higher during snowstorms, as Professor McAdie believes, than at other times; at least the fatality on Mount Whitney occurred during a snowstorm.

The puzzle is that the discharge took place not at the summit, but upon the rocks below. A possible reason may be found in the suggestion of Dr. R. S. Minor that the "scud" which was sweeping between the heavier clouds above and the mountain mass may have become electrified by passing between the two poles, and then have discharged its electricity as it was swept down nearer the mountain, where the air currents swirl in its lee."

So far the discharges on Mount Rose have occurred at this lower point, and this habit may prove to be the security of the observatory. The large extent of the summit over which the brush discharge was active and the intensity of the discharge indicate imminent danger to the entire observatory. It was believed, when the observatory was planned, that such bolts would be induced to strike the high intake pipe on the crest; but such a conductor, it seems, would prove insignificant on account of the gigantic proportions of the electric activity. Besides it is impossible to create a satisfactory circuit from tank to mountain, for the summit is apparently one mass of shivered rock whose interstices are filled only with dry earth.

A nice cage in which to sit during thunderstorms has been suggested as affording possible immunity for the observers. It is possible that the observatory itself, which is sheathed with Malthoid roofing above and nestled in the rocks below, may serve the same purpose. The placing of wire netting around the louvered shelter where the meteorograph is in-

stalled might afford protection, but the anemometer mast may attract sufficient electricity to fuse the netting and reach the instruments by way of the mechanical connections. There has been no actual danger on Mount Rose, so far as known, during the past three years, except on October 20, 1907.

EARTHQUAKES ON THE PACIFIC COAST.

By Prof. ALEXANDER G. MCADIE. Dated San Francisco, Cal., January 21, 1908.

It has been brought to my attention by Prof. George Davidson that Belcher gives a short list of some earthquakes on the Pacific coast. Mention of these earthquakes is not found in Holden's Catalog of Earthquakes on the Pacific coast, and publication at this time may be of interest to seismologists throughout the world. Professor Davidson has also shown me in an old book in his possession a note concerning an earthquake felt by Francis Drake in March(?), 1579. Drake had sailed from Panama on March 13, and a few days later, while anchored off the southern coast of Costa Rica, felt a sharp shock.

In Belcher's "Voyage Round the World," London, 1843, Vol. I, p. 147, appears the following record for Acapulco, Mexico:

As far back as the year 1732 earthquakes of uncommon force have continued to afflict this city. On the 25th of February of that year a very heavy earthquake destroyed nearly the whole town. The sea rose to a great height, covering the Plaza (or about 10 feet perpendicular), the successive risings, after receding, recurring slowly at the periods of the several shocks.

On the 17th of August, 1754, another earthquake occurred, ruining the greater part of the town. On this occasion the rising of the sea was attended with more violence; the Plaza was again covered.

On the 21st of April, 1776, an earthquake occurred which destroyed many houses.

On the 14th of March, 1787, the whole town was ruined. The sea retired, leaving the rocks of the Punta Manzanilla (in the town bay) dry. The *Philippine*, Nao, was anchored at the time in the port and was left in 4 fathoms before the tide returned—showing a fall of 36 feet.

No earthquake of consequence is recorded afterward until that of the 2d of May, 1820. This earthquake lasted several days, and entirely destroyed the place. The steeple of San Francisco fell on this occasion and the church was rent; the sea retired still farther than in 1787, and returned in two hours, rising up to the church door; the rise and fall taking place gently. At the ultimate recession the sand was found to have accumulated so as to nearly cover the pier (5 or 6 feet) by which upward of twenty varas of land was gained at the beach.

On the 10th of March, 1833, about 10 o'clock at night, a heavy earthquake was experienced. The sea retired 40 feet, and gently resumed its former level. This was felt at Mexico at precisely the same hour, lasting there about one minute and a half, the motion there being undulatory, but at Acapulco trepidatory.

On March 13, 1834, another shock is recorded; the sea receded fifty varas and several buildings were destroyed.

On the 6th of January, 1835, at 6 o'clock in the morning a very severe earthquake was felt, lasting upward of two minutes; motion trepidatory, the shocks recurring every thirty hours for upward of a month. This, like that of 1833, was felt in Mexico.

On the 9th of August, 1837, a heavy shock was felt, trepidatory, recurring at thirty hours for nearly three weeks. It was felt slightly at Mexico.

On the 18th of October, 1837, at 4 p. m., a heavy earthquake occurred, which lasted until the 22d. During this interval of four days the earth trembled continuously; one hundred separate shocks were counted between 4 p. m. 18th, and 10 p. m. 22d. During this interval five very severe shocks occurred, 4 p. m. 18th, 10 p. m. 19th, midnight 19th, 4 p. m. 20th, and 4 p. m. 21st. That at midnight on the 19th was terrific. Had it lasted a few seconds longer, rocks would undoubtedly have been rent asunder. Following this earthquake, for six weeks continuously, periodical heavy shocks were experienced, at 10 a. m., 10 and 12 p. m., and at dawn. At Mexico the shocks were severely felt at the same instants, on the 18th and 19th.

In conclusion *daily temblors* have occurred since the earthquake of 1820. But the season when the heaviest shocks occur is between March and June.

The above is extracted from notes made by a commissary resident for many years, and constantly holding office under the government of all parties.

FURTHER OBSERVATIONS OF HALOS AND CORONAS.

By M. E. T. GHEURY. Dated Eltham, England, August 3, 1907.

The accompanying table¹ gives my observations of halos, coronas, etc., during April, May, and June, 1907.

¹This table closely follows in arrangement, abbreviations, etc., the table of the author's previous paper printed in the Monthly Weather Review, May, 1907, p. 213-215.—EDITOR.